INTERNATIONAL RESEARCH JOURNAL OF PHARMACY
www.irjponline.com ISSN 2230 – 8407
Review Article

A REVIEW ON *SARACA INDICA* PLANT

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Article Received on: 11/02/12 Revised on: 20/03/12 Approved for publication: 28/03/12

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ABSTRACT
Saraca indica is an important indigenous plant with lots of traditional importance belonging to the family caesalpinaceae. These are the wonderful herb that claims to cure several diseases according to ayurvedic medicine. It mainly contains glycosides, tannin, saponin, flavonoids, and sterol. It posseses various activities such as analgesic, antipyretic, fungitoxic, anthelmintic, antidiabetic, larvicidal activity, antimicrobial activity, CNS depressant activity, Antiulcer activity, anti-inflammatory activity etc. This review contains pharmacognostic study of various parts of plant, phytochemical constituents and pharmacological activities of various parts of plant.
Keyword: Glycosides, larvicidal, Tannin.

INTRODUCTION

Herbal medicine has such an amazing influence that numerous alternative medicine therapies extravagance their patient with herbal remedy, unani and ayurveda. In spite of the advancement made in medical research for the past decade, the healing of many is severe disease still challenging. *Saraca indica* is one of the most leading plants utilized from ancient times till to date. *Saraca indica* is an evergreen tree. It is very popular in India and is native to India. In India, it has been used as ayurvedic traditional medicine as well as it is known to be sacred and is used in religious ceremonies. *Saraca indica* has been greatly used as traditional medicine for women related problems, such as leucorrhoea, menorrhagia, dysfunctional uterine bleeding, bleeding hemorrhoids etc.[1, 2]

Distribution

The Ashoka is a rain-forest tree. Its original distribution was in the central areas of the Deccan plateau, as well as the central point of the Western Ghats in the western coastal region of the Indian Subcontinent. The Ashoka is valued for its beautiful flora and perfumed flowers. It is a very attractive, small, erect evergreen tree; with deep green leaves budding in dense clusters. Its flowering season is around February to April. The Ashoka flowers come in heavy, lush bunches. They are bright orange-yellow in color, turning red before sagging as a wild tree; the Ashoka is a vulnerable species. It is becoming rarer in its natural habitat, but isolated wild Ashoka trees are still to be found in the foothills of central and eastern Himalayas, in scattered locations of the northern plains of India as well as on the west coast of the Subcontinent near Mumbai. There are a few varieties of the Ashoka tree. One variety is superior and highly distribution. The columnar varieties are common in cultivation.[3]

Scientific classification

Kingdom: Plantae
Order: Fabales
Family: Fabaceae
Genus: *Saraca*
Species: ***S. indica***[4]

Ecology and distribution

Cultivation

1. Soil and climate: The plant requires slightly acidic to neutral soils for superior growth with medium to deep well exhausted fertile soils. It grows well in tropical to sub-tropical situations under irrigation.

2. Nursery raising and planting: The crop can be propagated by seeds and stem grafting. The seedlings are planted in the well manures field during the rainy season.

3. Thinning and weeding: Weeding and thinning of the plants may be done as and when required usually after 15-30 days for better growth.

4. Manures, fertilizers and pesticides: The medicinal plants have to be grown without chemical fertilizers and use of pesticides. Organic manures like, Farm Yard Manure (FYM), Vermi-Compost, Green Manure etc. may be used as per requirement of the species. To prevent diseases, bio-pesticides could be prepared (either single or mixture) from Neem (kernel, seeds & leaves), Chitrakmool, Dhatura, Cow's urine etc.

5. Irrigation: Normally grown as rainfed crop but for better yield irrigation may be done as per requirement (weekly/fortnightly).

6. Harvesting/ post harvesting operation: Bark is removed from about ten years or older tree and then it has to be sun dried.[5]

Botanic description

Saraca indica is a small to medium sized tree handsome evergreen tree quite beautiful when it full bloom its height about 7-10 cm. It cultivated the up to the altitude 750 meters. Leaves are parpinnate 15-20 cm long and the leaflets 6-12, oblong and rigidly sub-coriaceous. Leaves are narrowly lanceolate, cork like at the base and with a shot pestistipules are intra-petiolar and completely united. The bark is dark brown or grey or almost black with warty surface. Stem bark are irregular and rough due to the presence of rounded or projecting lenticels. Bark channeled, smooth with circular lenticels and traversely ridged, sometimes cracked. Fracture splinting exposing striated surface, a thin whitish and continuous layer is seen below the cork leaver. Flowers are fragrant. Flowers are Polygamous apetalous, yellowish orange turning to scarlet, in short laterally placed corymbose,

axillary panicles, bract small, deciduous, calyx petaloid. Seeds are 4-8, ellipsoid-oblong and compacted. [2, 6, 7, 8]

Phytochemistry

The phytochemistry study show in the bark of plant presence of epicatechin, catechin, procyanidin p2 , 11 – deoxyprocyanidin B , leucocyanidin etc .The flower part of plant contain oleic,linoleic,palmitic and stearic acids,P-sitosterol,quercetin,kaemferol-3-O-P-D-glucoside, quercetin-3-o-P-D-3-o-P-D-glucoside,apigenin-7-o-P-D-glucoside, Pelargonidin-3,5-diglucoside, cyaniding -3 etc.[9] Catechin is the well-known flavonoids found in the stem bark of saraca indica identified by the HPTLC.[10] Seeds and pods contains oleic ,linoleic, palmitic ,stearic, catechol, epicatechol and leucocyandin. Leaves and stem found to contain quercetin, quercetin -3-o-alpha-l-rhamnoside, kaempferol 3-o-alpha-L-rhamnoside, ceryl alcohol and beta-sitosterol.[11, 12]

Foreign Matter

The 50 gm sample was spread in a thin layer, and the pieces of foreign matters were sorted out by visual inspection. The powder of foreign matter was sifted through a 250 micron sieve. All portions of the foreign matter were pooled and weighed.

Loss on Drying

10 gm of the drug was weighted in a tarred evaporating dish. It was dried at 105°C for 5 hours and weighed. The drying and weighing was continue at 1 hour interval until difference two successive weighing correspond not more than 0.25%.

Ash Values

Total ash value

About 3 gm accurately weighed powdered drug was incinerated in a silica dish at a temperature not exceeding 4500C until free from carbon. It was then cooled and weighed. The % w/w of ash with reference to the air-dried drug was calculated.

Acid insoluble ash value

To the crucible containing the total ash was added 25 ml of hydrochloric acid. The crucible was then covered with a watch-glass and the mixture was boiled gently for 5 minutes. The watch-glass was rinsed with 5 ml of hot water and this liquid was added in to the crucible. The insoluble matter was collected on an ash less filter-paper and washed with hot water until the filtrate was neutral. The filter-paper contain the insoluble matter was transferred to the original crucible, dried on a hot plate and ignite to constant weight. The residue was allowed to cool in a desiccators for 30 minutes and then weighed.

Water soluble ash value

Total ash obtained was boiled for 5 minute with 25 ml of water. Insoluble matter was collected in a crucible or an ash less filter paper. Washed with hot water and ignite for 15 minute at temperature not exceeding 450°C. Weight of insoluble matter was subtracted from the weight of the ash, the difference in weight was representing the water soluble ash. Percentage of water soluble was calculated with reference to the air dried drug.

Sulphated ash value

1 gm of substances was taken in an accurately weighed crucible, ignited gently at first until a substance is thoroughly charred. Cooled and the residue was moistened with 1 ml of sulphuric acid, heat gently until white fumes was no longer evolved and ignite at 8000C until black particle were disappeared. Allowed the crucible to cool, few drops of sulphuric acid were added and heat. Ignite as before, allowed to cool and weigh. Operation was repeated until two successive weighing was not differing by more than 0.5 mg.

Extractive Values

Alcohol soluble extractive value

5 gm of the air dried coarsely powdered drug was macerate with 100 ml of alcohol of the specified strength in a closed flask for 24 hour. Shaking frequently during 6 hour and allowed to stand for 18 hour. Filter rapidly and evaporate 25 ml of the filtrate to dryness in tarred flat bottomed shallow dish and dry at 105°C to constant weight and weigh.

Water soluble extractive value

5 gm of the air dried coarsely powdered drug was macerate with 100 ml of distilled water in a closed flask for 24 hour. Shaking frequently during 6 hour and allowed to stand for 18 hour. Filter rapidly and evaporate 25 ml of the filtrate to dryness in tarred flat bottomed shallow dish and dry at 105°C to constant weight and weigh.

Foaming Index

1 gm coarse powder was weighted and transferred to a 500 ml conical flask containing 100 ml of water. It was maintained at moderate boiling for 30 minute. It was cool and filtered in to a 100 ml volumetric flask. Volume was diluted by adding sufficient amount of water. The decoction was poured in to 10 Stoppard test tubes in successive portion of 1 ml, 2 ml, 3 ml-etc. Upto 10 ml and the volume of liquid in each test tubes was adjusted to 10 ml with water. The tubes were Stoppard and they were shaken in a lengthwise motion for 15 seconds, two shake per second. They were allowed stand for 15 minutes and the height of foam was measured.

Crude Fiber

2 gm of powder drug was taken in a beaker, add 50 ml of 10% v/v nitric acid. Heated to boil with constant stirring (till about 30 second after boiling start). Strain through fine cotton cloth on buchner funnel and residue was washed with boiling water. Transfer the residue from cloth to a beaker and 50 ml of 2.5% v/v Sodium hydroxide solution was added and heat to boil, maintain at boiling point for 30 second with constant stirring. Strain and washed the residue with hot water, transfer in cleaned & dried crucible for quantitative determination. Weigh the residue and percentage of crude fiber was determined.[13, 14, 15, 16]

Phytochemical screening

Subsequent chemical test were performed for testing different chemical groups nearby in both the extract.

Alkaloids

Mayer's test: To 2-3 ml of the extract, few drops of Mayer's reagent (1.36 gm of mercuric chloride and 5 gm of potassium iodide in 100 ml of water) were added. Formation of cream color precipitate indicates presence of alkaloids.

Amino acids

Million's test: To 2 ml of test extract about 2 ml of million's reagent (mercury nitrate) was added white precipitate indicating the presence of amino acid.

Carbohydrate

Molish Test: To 2 ml of test extract, at first few drop of alcoholic α-naphthol were added, then through side of test tube few drops of concentrated sulphuric acid are mixed with it. Purple or violet color ring appeared at the junction indicate the presence of carbohydrates.

Flavonoids

Alkaline reagent test: To 2 ml of test extract few ml of sodium hydroxide solution were added. At first intense yellow color at formed which was consequently turned to colorless, on addition of few drops of dilute acid indicate the presence of flavonoids.

Glycosides

Brontrager's Test: The test extract was boiled with 1 ml of the sulphuric acid in a test tube for 5 min. While hot, it was filtered and then cooled. Shaking of the mixture was done with equal volume of chloroform. Two layer of solution were formed. The lower layers of chloroform were separated. Then that layer was stunned with half of its volume of dilute ammonia. Production of the rose pink to red color suggested the presence of glycoside.

Saponin

Froth formation test: To mililitre of extract was shaken dynamically with water in a test tube. Formation of constant froth indicated the presence of saponins.

Tannins

Gelatin test: To 2 ml of extract,1% gelatin solution containing 10% sodium chloride was added. Creation of precipitate suggested the presence of tannins.

Protein

Warming test: 2 ml of extract was heated in a boiling water bath. Protein was coagulated due to heating.

Steroids and Triterpinoids

Salkowaski Test: The test extract was treating with few drops of concentrated sulphuric acid. Red color at lower layer indicate existence of steroid, whereas formation of yellow colored at the lower layer suggested the presence of triterpinoids.[17]

Pharmacological activity of *Saraca indica*

Antibacterial Activity

The flowers and flower buds of *Saraca indica* extract was reported antimicrobial activity against enterobacteria. This antibacterial activity of water soluble fraction was determined by minimum inhibitory concentration (MIC) method. (Antibacterial activity of flower). [18] *Saraca indica* stem bark also show antimicrobial activity against standard strains of *Staphylococcus aureus, E.coli, Salmonella typhimurium* etc.[19] *Saraca indica* leaves extracts are subjected to antibacterial activity. In order to determine the antibacterial activity of the ethanoli and methanolic extracts of *Saraca indica*, the nutrient agar well diffusion method, as described by schillenger and luke (1989), was performed. In this method the diameter of the zones of inhibition n each case were calculated. The ethanolic and water extract of bark of saraca indica are efficient in vitro against of *Staphylococcuc aureus, Pseudomonas aeruginosa* and *Proteus vulgaris*. In addition, some other researchers have also indicated that ethanolic and water extract of the leaves of the plant illustrate antibacterial activity just against Escherichia coli. Morever,the methanolic and water extract of the leaves are valuable against *Baccilus subtilis, Pseudomonas aeruginosa, Salmonella typhimurium*. Both the ethanolic and methanoli extracts were used at 100 µg/ ml and 200µg/ml for in vitro antibacterial activity. The largest zone of inhibition was produced when ethanolic extract (100 µg/ml and 200 µg/ml) was used in opposition to *Escherichia coli*, zone was used least in case of *Staphylococcus aureus*. However methanolic extract (100µg/ml and 200µg/ml) gave maximum zone of inhibition in opposition to *Staphylococcus aureus* and it was minimum in case of *Bacillus subtilis*.

Chloramphenicol was initiate to produce maximum and minimum zones of inhibition against *Staphylococcus aureus* and *Bacillus subtilus*, respectively. Although our extracts were substandard to the positive control (chloramphenicol) as much as zones of inhibition were concerned, the difference between the zones of inhibition produced by the positive control and the extract in opposition to *E .coli* and *Baccilus subtilis* were no remarkable. So it may be concluded that both the extract, even at low conc.possess antibacterial activity.[20, 21] *Saraca indica* also evoked strong bactericidal activity against *V.cholerae* and *A. hydrophila* with MBC ranging from 1-5 mg/ml.[22]

Anthelmintic activity

Saraca indica leaves extract has been used for anthelmintic activity, for this we used both maceration and soxhelet method of extraction by using solvent like ethanol and methanol. Each extract was tested for its anthelmintic activity by standard method. The suspension of both the extract obtained from the maceration and soxhlet method, was prepared in DMSO to obtain 1,2.5 and 5% conc. of the standard anthelmintic drug like Piperazine citrate (as positive control) were also prepared as negative controls. Two mililitre of each conc. of both methanolic and ethanoli fractions and Piperazine citrate were diluted to 10 ml independently with normal saline and pour into petridishes. Nine group of approx. equal extent of earthworms, consisting of six in number in each group were released into each petridish. Found that the ethanolic as well as methanolic extract were tougher than the positive control as much as anthelmintic property. Glycosides, alkaloids, tannin, flavonoids and terpenoids seems to be the accountable phytochemical constituent for signifying anthelmintic activities of ethanolic and methanolic extracts.[23, 24]

Analgesic activity

Saraca indica leaves extracts are accountable for analgesic activity. All the leaf extracts like petroleum ether, chloroform, methanol and water were investigated for phytoconstituents like sterols, glycosides, saponins, carbohydrates, alkaloids, flavonoids, tannin, protein etc. The analgesic activity of above extracts was evaluated by using tail immersion method and formalin induced pain method in albino mice. Analgesic activity of petroleum ether (PSI), chloroform (CSI), Methanol (MSI) and water (WSI) extracts were investigated at a dose of 200 and 400 mg/kg. Extract create dose dependent analgesic activity. Methanol extract at a dose of 400mg/kg produced highest activity. MSI produced 52.64 and 43.30% inhibition of formalin induced pain response in first and second phase respectively, whereas standard drug pentazocine (10 mg/kg) produced 61.3 and 52.38% pain response inhibition.[25] Formalin test is one of the principal analgesic model to compare with clinical pain. In the early phase of formalin test pain arise due to the direct stimulation of the sensory nerve fibers by formalin while in the late phase pain was due to inflammatory mediators, like histamine, Prostaglandins, serotonin and bradykinins.

Antidiabetic activity

Diabetes mellitus is an ailment common in all parts of the world. The use of insulin and control achieved over the ailment are of relatively recent origin when one takes into account the long history of this disease. For ethnobotanical survey of the plants various plants are used for management of diabetes. Dried flower powder of the plant *Saraca Indica* is taken with milk or honey and bark decoction is taken twice a day for the treatment of diabetes.[26]

CNS depressant activity

Saraca indica leaves possessed CNS depressant activity. The leaves of saraca indica extracted successively with petroleum ether, chloroform, methanol, and water respectively depending upon their polarity. CNS depressant activity was evaluate using penobarbitone induced sleeping time and by formative locomotor activity using actophotometer. Methanolic extract of *Saraca indica* leaves (400 mg/kg)

produced highest activity as it extensively reduced the onset and prolonged of sleep duration induced by pentobarbitone. Effects of MSI and WSI at a dose of 400mg/kg are comparable with the effect produced by standard drug chlorpromazine. But CSI (200 mg/kg) and PSI(200 and 400 mg/kg) did not produce significant decrease in onset of action and increase in duration of action. Extracts of *Saraca indica* significantly decreased the locomotor activity in mice by 67.33%.Thus we concluded that *Saraca indica* leaf possess CNS depressant activity.[27]

Antiulcer activity

Saraca indica plant possesses the antiulcer activity. The aqueous suspension of *Saraca indica* flower used against the gastric ulcer in albino rats. The major constituents of *Saraca indica* flowers contain saracacin, saracadin, waxy substance, fatty acids and flavonoids etc.[28] The effect of aqueous suspension of *Saraca indica* flower was investigated in albino rats to estimate the antiulcer activity by using two models, i.e., pyloric ligation and aspirin induced gastric ulcer. Both of these method the ulcer index and percentage inhibition of ulceration is calculated after dosing. These parameters taken to assess antiulcer activity were free and total acidity and ulcer index.[29, 30] *Saraca indica* flower aqueous suspension treatment significantly reduced basal gastric secretion and prevented the occurrence of AGML (acute gastric mucosal lesions) in pylorus ligated rats and thus, supporting the hypothesis of "no acid no ulcer''[31] In conclusion, *Saraca indica* flower suspension exhibits an antiulcer potential activity through at least one or more possible mechanism including inhibition of basal gastric secretion, stimulation of mucus secretion and endogenous gastric mucosal prostaglandin synthesis.

Anti-inflammatory activity

The ethanolic extracts of *Saraca indica* leaves find out the anti-inflammatory activity. These plants consist of beneficial chemical constituents, which help in treating various disease and disorders. The lack of potent analgesic and anti-inflammatory drugs now actually in use encouraged the present study, in which *Saraca indica* had been selected for their reported biological activities in indigenous system of medicine.[32] The leaves of *Saraca indica* determined the anti-inflammatory activity and brine shrimps lethality test. Diclofenac in the dose of 10 mg/kg was used as standard drug for anti-inflammatory activity. The brine shrimp assay is very useful for the isolation of biogenic compounds from plant extracts. Carageenan induced paw edema in animals is the most suitable test procedure to screen anti-inflammatory activity. Anti-inflammatory activity of ethanolic extract of *Saraca indica* reduced the paw edema significantly ($P<0.01$). The plant extract at the dose of 200 mg/kg showed significant anti-inflammatory activity. It caused 56.95% inhibition in increase in paw volume, though of a short duration and intensity, as compared to that of 10 mg/kg Diclofenac.[33, 34]

Larvicidal activity

Saraca indica, the pet ether extract of the leaves and the cholororm extract of the bark were effective against the larvae of *C.quinquefasciatus* with respective LC50 values. 228.9 and 291.5 ppm.[35] The larvicidal bioassay follow the WHO standard protocols. For experimental treatment, 1ml of plant extract dissolved in absolute ethanol was added to 99 ml of distilled water in a 150 ml disposable wax coated paper cup, which was shaken lightly to ensure a homogenous test solution. Then 25 early fourth-instar larvae of vector mosquitoes were transfer to each cup. Each experiment was performing in four replicates with a final total of 100 larvae for each concentration. The test containers were held at 27±2 ºc, 80-90 % relative humidity and a photoperiod of 12 h dark. After 24 h exposure, larval mortality was recorded. For slow acting insecticides, 48 h reading was recorded. The experiments were repeated twice.[36] The pet ether extract of leaves of *S.indica* showed larvicidal activity with LC50 and LC90 values of 228.9 and 458.3 ppm respectively. The chloroform extract of the bark of *S.indica* also show larvicidal activity with LC50 and LC90 values of 291.5 and 499.3 ppm respectively. [37]

Shigellocidal activity

The shigellocidal action was observed in extract of *Saraca indica*. These activity was detect via disc diffusion assay and TLC bioautography.[38] In disc diffusion method 10µl of plant extract (conc. 50 mg/ml) was saturated by sterile filter paper discs(5 mm in diameter).Which were impregnated with 10µl of plant extract placed on the surface of the medium and incubated at 37ºc for 24 24 h. The evaluation of antibacterial activity was based on the dimension of diameter of inhibition zone formed around the disc.[39] In TLC analysis- The plant extract were useful at 2.5 cm from the base of TLC plate prepared using silica gel-G. After drying, the TLC plates were developed with ethyl acetate: methanol: water (81:11:8) as the developing solvent and were run in duplicate. One set was used as the reference chromatogram and other set was used for bioautography. The TLC plates were developed by using spray reagent sulphuric acid/anisaldehyde, which were then heated at 110ºc. For 5-10 min and visualize under visible and u.v light at 254 and 366 nm.[40] Conclusion of that those plant show high MIC standards may be an sign of low efficacy of crude extract of plant, whereas plant show low MIC exacting in ethanol acetone extracts, could be a superior supply of bioactive components with antimicrobial potency.

Uterine tonic activity

Saraca indica is outstanding in ayurvedic medicine for its use as a stimulant to the endometrium and ovarian tissue. The oestrogenic effect of U-3107 (1gm/kg p.o) was considered in normal and ovariectomised rats. U-3107 was administered as an aqueous suspension for a period of 21 days. U-307 management in ovariectomized rats did not show any expand in uterine weight. U-3107 holds oestrogenic activity only in the presence of functional ovary and is devoid of any progestational activity. U-3107 (Eve Care) is a herbal preparation formulated by the Himalaya drug co. Bangalore with different plant extract which are useful in a variety of menstrual disorders such as puberty, menorrhagia, dysmenorrhoea, premenstrual syndrome, abnormal bleeding and threatened abortion.[41]

CONCLUSION

Saraca indica is one of the extensively used medicinal plants in Ayurveda. It is one of the universal plant having medicinal activities. Ashokarishta is the reliable and ancient source of medicine used to treat gynecological disorders like menorrhagia. This versatile plant is the source of various types of compound which are useful for various pharmacological activity such as antimicrobial activity, anthelmintic activity, analgesic activity, CNS depressant activity, antiulcer activity, antinflammatory activity, larvicidal activity, antidiabetic, shigellocidal activity, uterine tonic activity etc. As the global scenario is now altering towards the use of nontoxic plant product having conventional medicine use, development of recent drug from *Saraca indica* should be emphasized for the manages of different diseases.

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